

As a preliminary matter, Applicants wish to note that, although claim 1 stands allowed, claim 1 has been amended as shown to clarify that the water insoluble material being dispersed is a finely divided solid, as would be understood by those skilled in the art, especially in view of the specification at page 1, lines 10-12,<sup>OK</sup> and that the copolymer comprised in the dispersant is water soluble as disclosed in the specification at page 11, lines 12-14. Claims 9, 18, 37, 38, 39, 40, and 41 have also been so amended. In addition, claim 1 has been amended to correct two typographical errors.

#### Restriction Requirement

Claims 3-8 and 58-65 stand subject to a Restriction Requirement under 35 U.S.C. § 121, Applicants being required to elect one of Group I (*i.e.*, claims 1, 2 and 9-57) and Group II (*i.e.*, claims 3-8 and 58-65). During a telephone conference with the Examiner on September 27, 2001, Applicants provisionally elected, with traverse, to prosecute the invention of Group I. Applicants hereby confirm this election without prejudice to the filing of any divisional, continuation, or continuation-in-part application.

#### Provision of Abstract

The Examiner has asserted that Applicants have not provided an abstract of the disclosure as required by 37 C.F.R. 1.72(b) and has required that an abstract on a separate sheet be provided. Applicants have provided the same as an enclosure herein.

#### Rejection of Claims 15, 16, 24, 25, 26, 27, 29, 32, 46, 47-49, 51-54 and 55 Under 35 U.S.C. § 112, Second Paragraph

Claims 15, 16, 24, 25, 26, 27, 29, 32, 46-49, 51-54 and 55 stand rejected under 35 U.S.C. § 112, second paragraph, as being either vague or indefinite. Applicants respectfully traverse this ground of rejection for the following reasons. For clarity, Applicants address these issues in the order presented in the Office Action.

(a) The Examiner rejected claim 15 as vague for allegedly reciting Y as a carbon atom, and O as a sulfur atom or POR. Claim 15 (also claims 25 and 47) has been amended to clarify that Y represents a carbon atom, or the group O=S, or the group POR. This also clarifies that, according to convention, “P” in “POR” represents phosphorus and “O” in “POR” represents oxygen.

The Examiner has asked what “R” in “POR” stands for. Applicants note that claim 15 clearly recites that R represents a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or a carboxylated such radical), as would be well understood by those skilled in the art.

The Examiner has also asked how hydrogen in the same formula could be represented by both R<sub>2</sub> and R. To clarify this, Applicants note that R and R<sub>2</sub>, as defined in amended claim 15 are generally not the same in that R<sub>2</sub> generally represents hydrogen, C<sub>1</sub> to C<sub>4</sub> alkyl, or CH<sub>2</sub>CO<sub>2</sub>H, while R generally represents hydrogen or an alkyl radical having from 1 to 10 carbon atoms (or a carboxylated such radical). So, in the one instance where R<sub>2</sub> is hydrogen, and R also is hydrogen, then hydrogen is represented by both R<sub>2</sub> and R.

Additionally, the Examiner has indicated that the meaning of the word “residue,” as used in claim 15, is not clear. Those skilled in the art, in considering formula I and the definition of R<sub>1</sub>, as set forth in claim 15, would readily appreciate that R<sub>1</sub> is a cation. To clarify this, claim 15 (also claims 25 and 47) has been amended to replace the word “residue” with the word “cation.”

Applicants respectfully submit that the amendments to claim 15, considered with the above remarks, obviate the above ground of rejection with respect to claim 15.

The Examiner indicated that similar comments apply to claims 16, 25, 26, 47 and 48. Applicants respectfully submit that the Examiner’s bases for rejecting claims 16, 25, 26, 47 and 48 that are the same or similar as his bases for rejecting claim 15 have also been obviated in view of the above amendments and remarks made with regard to claim 15 and in view of those amendments to claims 25 and 47 that parallel the amendments to claim 15.

(b) Claims 29, 32 and 51 stand rejected as allegedly vague for reciting “agriculturally acceptable salt” whose meaning, according to the Examiner, is unclear. Applicants respectfully disagree and submit that this expression is clearly understood by those skilled in the art. The latter, in this regard, understand that a dispersant salt would be agriculturally acceptable if it were sufficiently soluble so as not to hinder spraying of the formulation when used by a farmer, sufficiently soluble to function as a dispersion stabilizer, and non-toxic so as to not harm the environment. As examples, salts that would not be considered agriculturally acceptable would be osmium salts, due to toxicity of the metal, or radioactive salts such as cesium. Further, the above expression is analogous to “pharmaceutically acceptable salt,” which is used in connection with pharmaceutical products to indicate suitability for their intended purpose.

(c) The Examiner has rejected claims 27 and 49 as allegedly vague for reciting the expression “will not substantially change,” the meaning of which, the Examiner asserts, is not clear. Applicants respectfully disagree. First, this expression must be considered in context. The full expression that must be considered is “will not substantially change the character of the polymer.” The word “character” here clearly refers to the dispersant properties of the copolymer. In other words, claims 27 and 49 refer to the copolymers including residues of additional monomers (permissible in view of the “comprising” language used in claims 18 and 37), but to an extent insufficient to substantially alter the dispersant properties of the copolymers. That this is clear is evident from the specification at page 19, lines 9-15, where it is made clear that the copolymers can contain additional comonomer residues and still be suitable for use in the present invention, that is, for use as water soluble dispersants effective to disperse finely divided solid, water insoluble materials so as to suspend the same in aqueous media.

As to the use of the word “substantially” here, the text of claims 27 and 49 is equivalent to saying that the character of the copolymers having additional comonomer residues is substantially the same or equal to the character of the copolymers without the additional comonomer residues. Courts have held that “substantially equal” is a term of degree and that its

acceptability depends on whether one of ordinary skill in the art would understand what is claimed when read in light of the specification, even if experimentation may be needed. Again, one skilled in the art would understand from reading the specification that what is meant by “substantially change the character of the copolymer” is that the copolymer will still be effective as a dispersant for the applicable materials.

(d) Claim 55 stands rejected as allegedly vague as the Examiner finds that the meaning of “copolymers are in the range of 1000 to 90000 daltons” is not clear. Applicants have obviated this basis for rejection by amending claim 55 to clarify that it is the molecular weight of the copolymers that is in the recited range of daltons. Applicants wish to point out that claim 33 has been amended in a similar manner.

(e) The Examiner has rejected claims 24 and 46 as indefinite in containing improper Markush terminology. Applicants have amended the claims accordingly so as to obviate this basis for rejection.

(f) Claims 25 and 26 stand rejected as indefinite for reciting a group having only one member. The claims have been amended accordingly so as to obviate this basis for rejection.

(g) The Examiner has rejected claim 54 as allegedly indefinite in reciting “derivatives” in lines 21 and 22 of the claim, asserting that it is not known which specific derivatives are envisioned in the scope of the claim. Applicants respectfully disagree and submit that those skilled in the art clearly understand how to prepare any of the defined derivatives of the copolymers defined in claims 37 and 54. Also, page 18 of the specification at lines 5-12 makes clear that the derivatives, having water solubility enhancing substituents, may also be obtained post copolymerisation from reaction of electrophilic groups, such as acids and acid derivatives pendant to the copolymer, with nucleophilic reagents such as alcohols, amines and thiols to give esters, amides, and thioesters, respectively.

Accordingly, Applicants respectfully request that the above ground of rejection be withdrawn.

Rejection of Claims 9-57 Under 35 U.S.C. § 103(a)

Claims 9-57 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 58131903 to Kataoka et al. (hereinafter, "Kataoka") in view of JP 62-36302 to Fujita et al. (hereinafter, "Fujita"). Applicants respectfully, but strenuously, traverse this ground of rejection for the following reasons.

It is well established that neither a single reference nor a combination of references can support a *prima facie* case for an obviousness rejection absent a finding therein of a teaching or suggestion of all limitations recited in the rejected claims. Further, the modification of a reference, or the combining of references, yielding the invention under examination, cannot be made to support *prima facie* obviousness absent some teaching, suggestion, or motivation to do so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art.

As the Examiner has noted, Kataoka does not mention the use of copolymers as dispersants for finely divided solid active water-insoluble agrochemical principles. Kataoka also does not teach or suggest that particular types of derivatised copolymers provide improved performance in connection with dispersing agrochemicals. The requirements for agrochemical formulations are fundamentally different from dispersions of pigments, bentonites (clays) and calcium carbonate. An agrochemical composition must be stable in a certain particle size range, be rapidly hydrated in granular form, and not be decomposed by dispersing ingredients. To illustrate this point, Applicants are aware that sodium salts of polyacrylic acid make excellent dispersants for clays, yet when these were tested for use in preparing water dispersible granular formulations, they failed miserably.

Accordingly, it is the particular derivatisation disclosed in the present specification that enables the copolymers to function as effective dispersants for finely divided solid water insoluble agrochemical principles. As another example, salts of styrene/maleic anhydride copolymers (SMA-3000 type dispersants), when used alone, lead to flocculation of the

dispersion (Example 7), but when derivatised with morpholine amide, perform excellently (Example 12).

Therefore, there is no teaching, suggestion, or motivation found either in Kataoka or Fujita, or in the knowledge generally available to those of ordinary skill in the art, to combine the references as suggested by the Examiner. Further, neither reference teaches or suggests all limitations of the present invention. Accordingly, the Examiner has not established a *prima facie* case of obviousness. Nevertheless, Applicants, in the interest of expediting prosecution of the present application, have amended claims 9, 18 and 37-41 to exclude the dispersants disclosed in the cited references to obviate the above ground of rejection.

Accordingly, Applicants respectfully request that the above ground of rejection be withdrawn.

As a final matter, Applicants note the following additional amendments:

Claims 15, 25 and 47 have been amended to clarify that  $R_3$  represents hydrogen. Support for this amendment is found, among other places, in the specification at page 12, line 1, in the disclosure of fumaric and maleic acid.

Claims 15, 25 and 47 have been amended to recite that  $R_2$  also represents  $\text{CH}_2\text{CO}_2\text{H}$ . Support for this amendment is found, among other places, in the specification at page 12, line 2, in the disclosure of itaconic acid.

Claims 16, 26 and 48 have been amended to clarify that  $R$  and  $R_1$ , recited therein is the same as the definition given to  $R$  and  $R_1$  throughout the rest of the specification and claims, for example, in the specification at page 14, lines 8-10, and in claims 15, 25 and 47.

Claim 26 has been amended to correct obvious typographical errors, namely the recitation of "first comonomer" (incorrect) instead of "second comonomer" (correct), and the recitation of  $\text{SO}_3\text{R}$  (incorrect) instead of  $\text{SO}_3\text{R}_1$  (correct) for  $\text{R}_{13}$ .

Claims 18 and 37-41 have been amended to clarify that the recited esters, amides and thioesters are derived from reaction with nucleophilic reagents, as would be well understood by those skilled in the art, reading the specification.

Finally, generally clarifying amendments have been made to claims 15, 16, 25, 26 and 48.

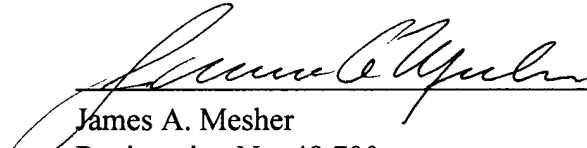
Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version With Markings to Show Changes Made."

In view of the above amendments and remarks, Applicants respectfully request allowance of claims 1, 2 and 9-57. A good faith effort has been made to place this application in condition for allowance. However, should any additional issue require attention prior to allowance, the Examiner is requested to contact the undersigned at (206) 622-4900 to resolve the matter.

Respectfully submitted,

Andrew Francis Kirby et al.

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WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

The paragraph beginning at page 5, line 22 has been rewritten as follows:

According to a second aspect of the present invention, there is provided a method of making an agrochemical formulation comprising the steps of:

- (i) combining at least one insoluble material, and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;
- (ii) milling said combination to a particle size range in order to obtain a stable, readily-suspendible aqueous dispersion; and
- (iii) stabilising said aqueous dispersion to obtain an SC formulation suitable for dilution in water for agricultural use.

The paragraph beginning at page 7, line 1 has been rewritten as follows:

According to a third aspect of the present invention, there is provided a method of making an agrochemical formulation comprising the steps of:

(i) combining at least one insoluble material, with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; and

(ii) milling said combination to a desired particle size to obtain a homogeneous wettable powder (WP) formulation.

The paragraph beginning at page 7, line 21 has been rewritten as follows:

According to a fourth aspect of the present invention, there is provided a method of making an agrochemical formulation comprising the steps of:

(i) combining at least one insoluble material suitable for agricultural use with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally

substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; and

(ii) blending said combination to obtain a homogeneous wettable powder (WP) formulation.

The paragraph beginning at page 8, line 18 has been rewritten as follows:

According to a fifth aspect of the present invention, there is provided a method of making an agrochemical formulation comprising the steps of:

(i) combining at least one insoluble material suitable for agricultural use with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

(ii) agglomerating said combination to form discrete granular materials; and

(iii) drying said granular materials to obtain a water dispersible granule WG formulation.

The paragraph beginning at page 9, line 20 has been rewritten as follows:

According to a seventh aspect of the present invention, there is provided an agricultural formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents.

The paragraph beginning at page 10, line 12 has been rewritten as follows:

According to an eighth aspect of the present invention, there is provided a method of treatment of a substrate with an insoluble material comprising the following steps:

(i) preparing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally

substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

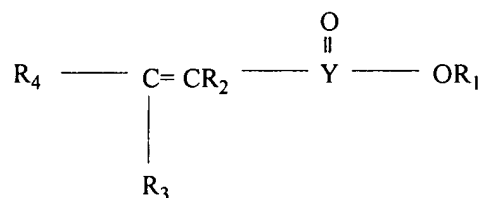
- (ii) dispersing said formulation in an aqueous medium; and
- (iii) applying the dispersed formulation to a ~~the~~ substrate.

The paragraph beginning at page 11, line 11 has been rewritten as follows:

The ~~derivitisation~~ derivatisation of the copolymer is of central importance to the invention herein described. While not wishing to be bound by theory, it appears that in addition to the enhanced solubility in water, it may confer additional polarity or charge density to the dispersant such as to enhance its performance. Further it may lead to better conformational alignment of the copolymer and therefore the copolymer is more readily soluble and may more readily align itself with surfaces. We have found that a non alternating polymer which is unsuitable for use as a dispersant when used as an alkali metal or quaternary ammonium salt derivative is significantly improved in dispersant performance when derivatised according to the present invention.

The paragraph beginning at page 14, line 4 has been rewritten as follows:

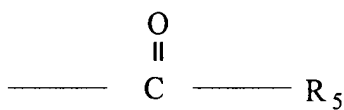
Preferred examples of the first comonomer may be described as having structure I:



I

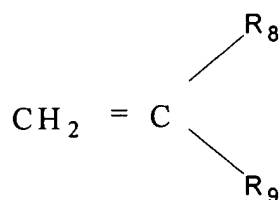
wherein R<sub>1</sub> is a metal, quaternary ammonium, phosphonium or sulphonium residue, R<sub>2</sub> is hydrogen or C<sub>1</sub> to C<sub>4</sub> alkyl, or CH<sub>2</sub>CO<sub>2</sub>H, Y is a carbon atom, the group O=S, or the group POR where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated

such radical), R<sub>3</sub> is hydrogen, and R<sub>4</sub> is Hydrogen, an alkyl radical or a carboxylic acid derivative of form II:



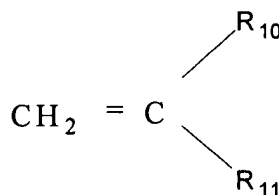
## II

wherein R<sub>5</sub> is OR<sub>6</sub>, NR<sub>6</sub>R<sub>7</sub> or SR<sub>6</sub>, wherein R<sub>6</sub> and R<sub>7</sub> are Hydrogen, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent. The second comonomer may be alternatively described as a residue having formula III:



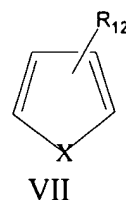
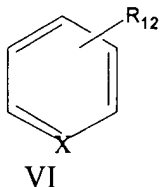
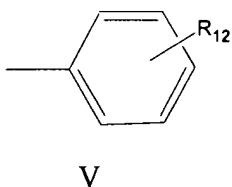
## III

wherein R<sub>8</sub> represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms, R<sub>9</sub> represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical, and/or a vinyl compound of formula IV:

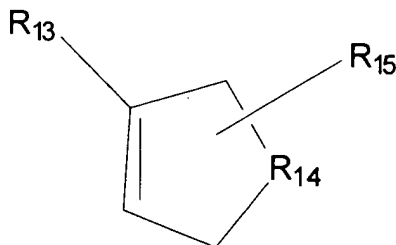


## IV

wherein R<sub>10</sub> is a straight or branched chain alkyl radical of from 1-4 carbons and R<sub>11</sub> is given by formula V, VI or VII:

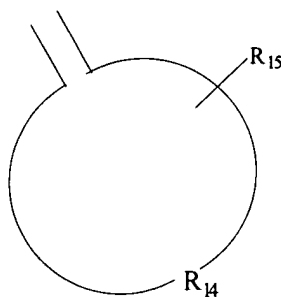


wherein  $R_{12}$  represents one or more alkyl radicals or one or more of  $H$ ,  $Cl$ ,  $OR_1$  and  $SO_3R_1$ ,  $SO_3R_1$ ,  $NO_2$ , and  $PO_3R_1$ , and  $X$  is a hetero atom other than carbon; and/or an olefin shown by formula VIII:



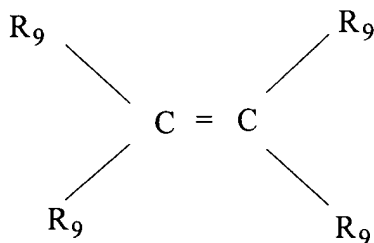
VIII

wherein  $R_{13}$  is  $Cl$ ,  $SO_3R_1$ , alkyl, O-alkyl or O-aryl, and  $R_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound, and  $R_{15}$  is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or an exocyclic olefin shown by formula IX:



IX

and/or an internal olefin shown by formula X:



X

where  $R_9$  is the same or different and as hereinabove defined.

In the Abstract

*There is no page 71*

The paragraph beginning at page 71, line 2, has been replaced with the following rewritten paragraph.

A novel agricultural formulation includes at least one finely solid water-insoluble material and at least one novel dispersant containing a polymer synthesized from first and second comonomers. The first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride, and the second comonomer is an olefin having at least one polymerizable double bond. Also disclosed is a method for dispersing a finely divided solid insoluble material, in particular, an active water-insoluble agrochemical principal, in an aqueous solution; a method for treating a substrate with such a material or principal; and a method of making an agrochemical formulation, where the methods are based on application of the novel dispersant to the preparation of aqueous dispersions of the solid material and agrochemical principal.

~~A method of dispersing an insoluble material in an aqueous solution comprising the following steps:~~

- ~~(i) providing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates, esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group~~

~~consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents dispersing said formulation in an aqueous medium.~~

~~A method according to claim 1 wherein the second comonomer is selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and, vinyl pyrrolidones.~~

In the Claims:

Claims 1, 9, 15, 16, 18, 24-26, 33, 37-41, 46-48, 55, and 57 have been amended as follows:

1. (Amended) A method of dispersing an solid insoluble material in an aqueous solution comprising the following steps:

(i) providing a formulation comprising at least one finely divided solid insoluble material and at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein the second comonomer is selected from the group consisting of  ~~$\beta$ -pinene~~pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene-cyclopentenecyclopentane;

(ii) dispersing said formulation in an aqueous medium.

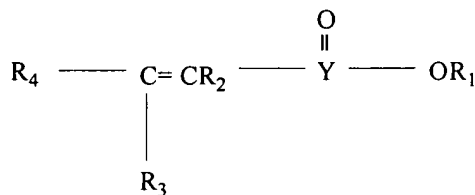
9. (Amended) A method of dispersing a solid active water-insoluble agrochemical principal in an aqueous solution comprising the following steps:

(i) providing a formulation comprising at least one finely divided solid active water-insoluble agrochemical principal and at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a

second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted:

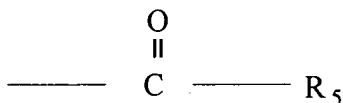
(ii) dispersing said formulation in an aqueous medium.

15. (Amended) A method according to claim 9 wherein the first comonomer ~~has a structure~~ is of formula I



I

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium ~~residue~~ cation,  $\text{R}_2$  is hydrogen, ~~or~~  $\text{C}_1$  to  $\text{C}_4$  alkyl, or  $\text{CH}_2\text{CO}_2\text{H}$ , Y is a carbon atom, the group  $\text{O}=\text{S}$ , or the group POR where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical),  $\text{R}_3$  is hydrogen and  $\text{R}_4$  is ~~H~~ hydrogen, an alkyl radical or a carboxylic acid derivative of formula II

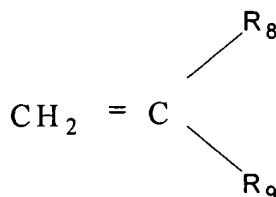


II

wherein  $R_5$  is  $OR_6$ ,  $NR_6R_7$  or  $SR_6$ , where  $R_6$  and  $R_7$  are hydrogen, alkyl, or alkyl groups with a hetero atom substituent.

~~wherein  $R_6$  and  $R_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.~~

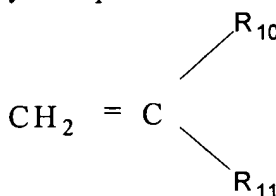
16. (Amended) A method according to claim 9 wherein the second comonomer is a vinyl compound of formula III



### III

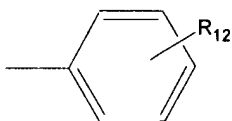
wherein  $R_8$  represents hydrogen, or a straight or branched chain alkyl of from 1-4 carbon atoms;  
and  $R_9$  represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms;  
 cycloalkyl radical;

and/or the second comonomer is a vinyl compound of formula IV

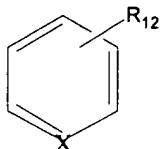


### IV

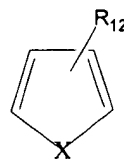
wherein  $R_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons, and  $R_{11}$  is given by formula V, VI or VII;



V



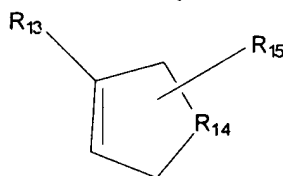
VI



VII

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of  $H$ ,  $Cl$ ,  $OR_1$ , ~~and~~  $SO_3R_1$ ,  $NO_2$ , and  $PO_3R_1$ , and X is a hetero atom other than carbon where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $R_1$  is a metal, quaternary ammonium, phosphonium or sulphonium cation;

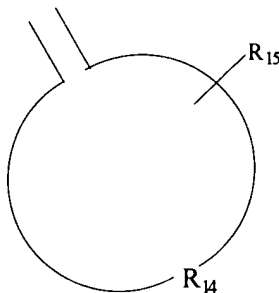
and/or the second comonomer is an olefin shown by formula VIII,



VIII

wherein  $R_{13}$  is Cl,  $SO_3R_{11}$ , alkyl, O-alkyl or O-aryl, ~~and~~  $R_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound, and  $R_{15}$  is an epoxide or  $SO_3R_{11}$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ;

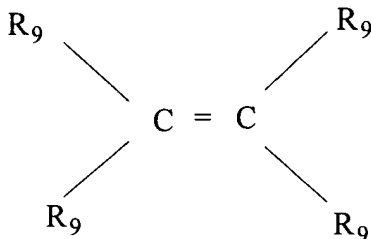
and/or the second comonomer is an exocyclic olefin shown by formula IX



IX

where  $R_{14}$  and  $R_{15}$  are as hereinabove defined;

and/or the second comonomer is an internal olefin shown by formula X,



X

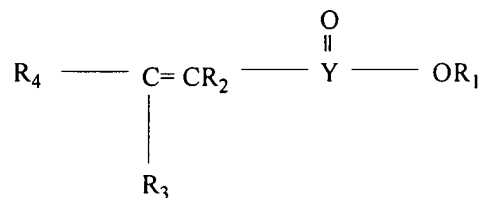
where  $R_9$  is the same or different and as hereinabove defined.

18. (Amended) An agricultural formulation comprising at least one finely divided solid insoluble material and at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second

comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted, and that when one of the first and second comonomers is substituted with an ester group containing a polyalkyleneoxy moiety, the other of the first and second comonomers must be substituted.

24. (Amended) An agricultural formulation according to claim 18 wherein the ~~first comonomers are selected from the group consisting of an  $\alpha$ -olefin~~ olefin is an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether ~~or and~~ vinylisobutylether.

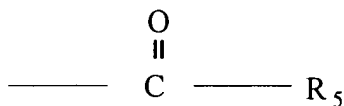
25. (Amended) An agricultural formulation according to claim 18 wherein the ~~first comonomers are selected from the group consisting of structure~~ is of formula I



I

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium ~~residue~~ cation,  $\text{R}_2$  is hydrogen, ~~or~~  $\text{C}_1$  to  $\text{C}_4$  alkyl; or  $\text{CH}_2\text{CO}_2\text{H}$ ,  $\text{Y}$  is a carbon atom, the group  $\text{O}=\text{S}$ , or the group  $\text{POR}$

where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical), R<sub>3</sub> is hydrogen and R<sub>4</sub> is ~~H~~hydrogen, an alkyl radical or a carboxylic acid derivative of formula II:

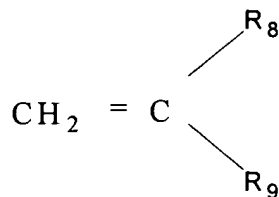


## II

wherein R<sub>5</sub> is OR<sub>6</sub>, NR<sub>6</sub>R<sub>7</sub> or SR<sub>6</sub>, where R<sub>6</sub> and R<sub>7</sub> are hydrogen, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

~~wherein R<sub>6</sub> and R<sub>7</sub> are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.~~

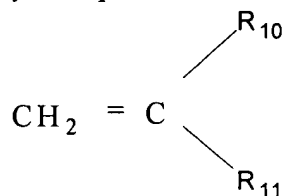
26. (Amended) An agricultural formulation according to claim 18 wherein the first second comonomer is ~~selected from the group consisting of~~ of formula III



## III

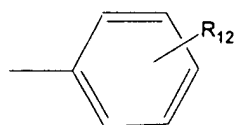
wherein R<sub>8</sub> represents hydrogen, or a straight or branched chain alkyl of from 1-4 carbon atoms, R<sub>9</sub> represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical;

and/or the second comonomer is a vinyl compound of formula IV

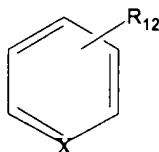


## IV

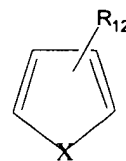
wherein R<sub>10</sub> is a straight or branched chain alkyl radical of from 1-4 carbons and R<sub>11</sub> is ~~given~~ by formula V, VI or VII;



V



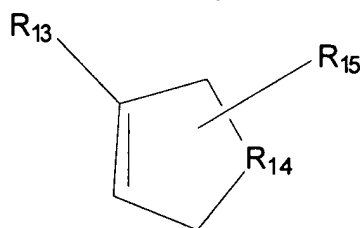
VI



VII

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of  $H$ ,  $Cl$ ,  $OR$  and  $SO_3R_1$ ,  $NO_2$  and  $PO_3R_1$ , and  $X$  is a hetero atom other than carbon, where  $R$  is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $R_1$  is a metal, quaternary ammonium, phosphonium or sulphonium cation;

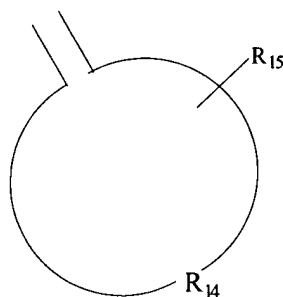
and/or the second comonomer is an olefin shown by formula VIII;



VIII

wherein  $R_{13}$  is  $Cl$ ,  $SO_3R$ ,  $SO_3R_1$ , alkyl, O-alkyl or O-aryl, and  $R_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound, and  $R_{15}$  is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ;

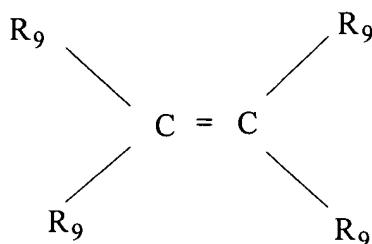
and/or the second comonomer is an exocyclic olefin shown by formula IX



IX

where  $R_{14}$  and  $R_{15}$  are as hereinabove defined;

and/or the second comonomer is an internal olefin shown by formula X,



X

where R<sub>9</sub> is the same or different and as hereinabove defined.

33. (Amended) An agricultural formulation according to claim 18 wherein ~~copolymers are the~~ copolymer has a molecular weight in the range of from 1000 to 90000 daltons.

37. (Amended) A method of making an agrochemical formulation comprising the steps of:

(i) combining at least one finely divided solid insoluble material, and at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted, and that when one of the first and second comonomers is substituted with an ester

group containing a polyalkyleneoxy moiety, the other of the first and second comonomers must be substituted.

38. (Amended) A method according to claim 37 comprising the steps of:

(i) combining at least one finely divided solid insoluble material, and at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted, and that when one of the first and second comonomers is substituted with an ester group containing a polyalkyleneoxy moiety, the other of the first and second comonomers must be substituted.

(ii) milling said combination to a particle size range in order to obtain a stable, readily-suspendible aqueous dispersion; and

(iii) stabilising said aqueous dispersion to obtain an SC formulation suitable for dilution in water for agricultural use.

39. (Amended) A method according to claim 37 comprising the steps of:

(i) combining at least one finely divided solid insoluble material, with- at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted, and that when one of the first and second comonomers is substituted with an ester group containing a polyalkyleneoxy moiety, the other of the first and second comonomers must be substituted; and

(ii) milling said combination to a desired particle size to obtain a homogeneous wettable powder (WP) formulation.

40. (Amended) A method according to claim 37 comprising the steps of:

(i) combining at least one finely divided solid insoluble material suitable for agricultural use with at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and

other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted, and that when one of the first and second comonomers is substituted with an ester group containing a polyalkyleneoxy moiety, the other of the first and second comonomers must be substituted; and

(ii) blending said combination to obtain a homogeneous wettable powder (WP) formulation.

41. (Amended) A method according to claim 37 comprising the steps of:

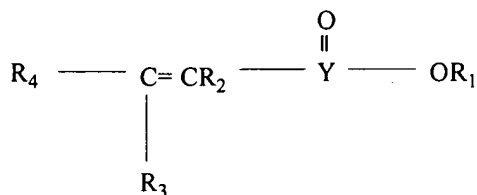
(i) combining at least one finely divided solid insoluble material suitable for agricultural use with at least one dispersant comprising a water soluble copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and other functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; with the proviso that when the second comonomer is sulphonated styrene or sulphonated isobutylene, the first comonomer is substituted, and that when one of the first and second comonomers is

substituted with an ester group containing a polyalkyleneoxy moiety, the other of the first and second comonomers must be substituted;

- (ii) agglomerating said combination to form discrete granular materials; and
- (iii) drying said granular materials to obtain a water dispersible granule WG formulation.

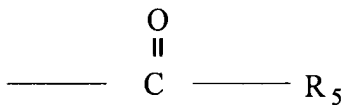
46. (Amended) A method according to claim 37 wherein the ~~second comonomer-olefin~~ is an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether ~~or~~ and vinylisobutylether.

47. (Amended) A method according to claim 37 wherein the first comonomer ~~has a structure~~ is of formula I



I

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium ~~residue~~ cation,  $\text{R}_2$  is hydrogen, ~~or~~  $\text{C}_1$  to  $\text{C}_4$  alkyl, or  $\text{CH}_2\text{CO}_2\text{H}$ , Y is a carbon atom, the group  $\text{O}=\text{S}$ , or the group POR where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical),  $\text{R}_3$  is hydrogen and  $\text{R}_4$  is ~~H~~ hydrogen, an alkyl radical or a carboxylic acid derivative of formula II

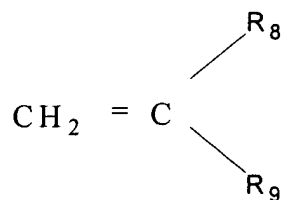


II

wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ , ~~or~~  $\text{SR}_6$ , where  $\text{R}_6$  and  $\text{R}_7$  are hydrogen, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

~~wherein  $\text{R}_6$  and  $\text{R}_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.~~

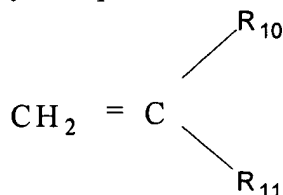
48. (Amended) A method according to claim 37 wherein the second comonomer has a structure of formula III



III

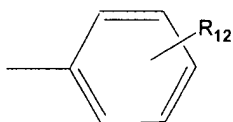
wherein R<sub>8</sub> represents hydrogen, or a straight or branched chain alkyl of from 1-4 carbon atoms, R<sub>9</sub> represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical;

and/or the second comonomer is a vinyl compound of formula IV

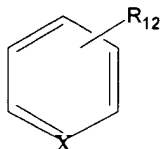


IV

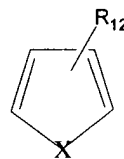
wherein R<sub>10</sub> is a straight or branched chain alkyl radical of from 1-4 carbons and R<sub>11</sub> is given by formula V, VI or VII;



V



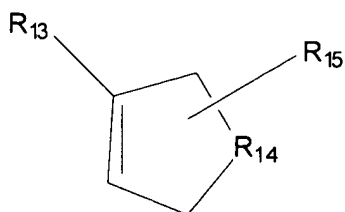
VI



VII

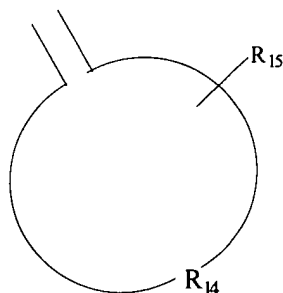
wherein R<sub>12</sub> represents one or more alkyl radicals or one or more of H, Cl, OR and, SO<sub>3</sub>R<sub>1</sub>, NO<sub>2</sub>, and PO<sub>3</sub>R<sub>1</sub>, and X is a hetero atom other than carbon, where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and R<sub>1</sub> is a metal, quaternary ammonium, phosphonium or sulphonium cation;

and/or the second comonomer is an olefin shown by formula VIII;



VIII

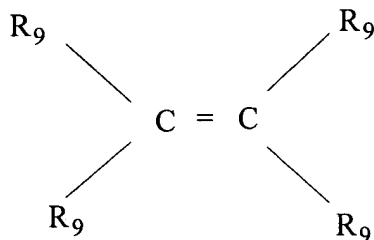
wherein  $R_{13}$  is Cl,  $SO_3R_{11}$ , alkyl, O-alkyl or O-aryl, and  $R_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound, and  $R_{15}$  is an epoxide or  $SO_3R_{11}$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or the second comonomer is an exocyclic olefin shown by formula IX



IX

where  $R_{14}$  and  $R_{15}$  are as hereinabove defined;

and/or the second comonomer is an internal olefin shown by formula X,



X

where  $R_9$  is the same or different and as hereinabove defined.

55. (Amended) A method according to claim 37 wherein copolymers are the copolymer has a molecular weight in the range of from 1000 to 90000 daltons.

57. (Amended) An agricultural formulation produced by the method of any one of claims 37 to ~~40~~41.

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